

## Title

### Utility Lighter with Improved Safety Arrangement

## Background of the Present Invention

### Field of Invention

5           The present invention relates to a utility lighter, and more particularly to a piezoelectric lighter incorporated with a safety arrangement that prevents the lighter from accidentally or undesirably ignited

### Description of Related Arts

10           Conventional lighters have been widely used all over the world. However, these conventional lighters can be operated so easily and conveniently that even children can ignite a light by using the conventional lighters without any difficulty. In such circumstances, it is extremely dangerous that a young child by chance gets a conventional lighter at hands but no other adults notice him/her. The child may ignite the lighter due to his/her curiosity and may eventually get burnt. In worse, a huge fire may even be caused.

15           Most accidental fire cases today, many were started by the ignorant usage of the lighter, especially a barbecue lighter used at home such as pilot light for stoves or outdoor activities such as fireplaces or camping. Those accidental fires are caused by ignorance of human mistakes, especially among young children. So, nowadays, both U.S. government and U.S. Consumer Product Safety Commission demand a safety device in  
20 every lighter including the barbecue lighter to prevent unwanted ignition accidentally or by a child.

          Therefore, a kind of locking switch incorporated with conventional lighters has been developed to prevent the lighter from being accidentally ignited. That kind of locking switch allows a user of the lighter to selectively switch it in a locked state or an unlocked  
25 state. The user can only ignite the lighter when it is in an unlocked state. Superficially, the locking switch is good in that it allows the user to lock the lighter and thus children are no

longer able to ignite it unattended. However, such conventional locking switch is incapable of automatically locking the lighter after use. Therefore, if a user forgets to re-switch to lock the lighter after use, a child can still be able to ignite the lighter and generate light.

## Summary of the Present Invention

5           A main object of the present invention is to provide a utility lighter incorporated with an improved safety arrangement, which is capable of automatically locking the lighter of the present invention from being accidentally ignited when it is idle or not in use.

10           Another object of the present invention is to provide a utility lighter incorporated with an improved safety arrangement, which can only be ignited by unlocking the safety arrangement of the lighter.

15           Another object of the present invention is to provide a utility lighter incorporated with an improved safety arrangement, which can only be ignited by two simultaneous actions of a user, i.e. an action of unlocking the safety arrangement and an action of igniting the lighter.

          Another object of the present invention is to provide a utility lighter incorporated with an improved safety arrangement, which does not significantly alter the original structure and shape of conventional lighters, so as to minimize the manufacturing cost of the lighter of the present invention.

20           Accordingly, in order to accomplish the above objects, the present invention provides a utility lighter incorporated with an improved safety arrangement which comprises:

25           a casing which has a lighter housing and a lighter rod upwardly extended therefrom, wherein the lighter housing has an internal cavity and a pusher cavity therein, wherein the lighter rod has an transmitting cavity communicated with the internal cavity therein and the lighter housing has a safety slot communicating the internal cavity and an exterior of the lighter housing;

a fuel storage housing disposed in the internal cavity of the lighter housing for storing liquefied gaseous fuel to ignite the utility lighter;

an ignition system which comprises:

5 a piezoelectric unit supported in the internal cavity for generating piezoelectricity, wherein the piezoelectric unit has a movable part and a fixed part;

a gas-emitting nozzle communicated with the fuel storage housing and adapted for releasing gaseous fuel when the gas-emitting nozzle is uplifted;

10 a gas tube extended from the gas-emitting nozzle to a top end portion of the lighter rod to form an ignition tip therein via the internal cavity and the transmitting cavity;

a spark-generating tip extended from the piezoelectric unit to the ignition tip via the internal cavity and the transmitting cavity, for generating sparks therein; and

a pusher button which is supported in the pusher cavity in a movable manner and operatively connected to the piezoelectric unit and the gas-emitting nozzle; and

15 a safety arrangement which comprises:

a stop post downwardly extended from the pusher button;

20 a locking member, which comprises an outer switching member extended outside the lighter housing through the safety slot and a stopper arranged for blocking up a downward movement of the pusher button, wherein the locking member has two sliding cavities formed at two sides of the stopper respectively and is movably supported by the lighter housing and adapted for being switch between a locked position and an unlocked position, wherein in the locked position, the stopper is aligned with the stop post to block the downward movement of the stopper, and wherein in the unlocked position, the stopper is moved out of alignment with the stop post, so that the pusher button is capable of moving downwardly to depress the movable part of the piezoelectric unit and generate sparks at the spark-generating tip to ignite gaseous fuel emitted from the ignition tip; and

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a resilient element mounted in the lighter housing for urging a pushing force to the locking member so as to normally retain the locking member in the locked position.

Whereby, a user can only ignite the utility lighter by pushing the locking member to an unlocked position and then depress the pusher button downwardly. After use, the user can simply relief the locking member and the pusher button, and they both will return to their original positions respectively.

### Brief Description of the Drawings

Fig. 1 is a perspective view of a utility lighter incorporated with a safety arrangement according to a first preferred embodiment of the present invention.

Fig. 2 is a sectional schematic view illustrating the internal structure of the utility lighter according to the above first preferred embodiment of the present invention.

Figs. 3A to 3F are partially sectional schematic views illustrating the safety arrangement of the utility lighter according to the above first preferred embodiment of the present invention, in which the utility lighter of the present invention is operated from a locked position to an unlock position for ignition.

Fig. 4 is a perspective view of the utility lighter incorporated with a safety arrangement according to a second preferred embodiment of the present invention.

Fig. 5 is a partially sectional schematic view of the safety arrangement of the utility lighter according to the above second preferred embodiment of the present invention.

Fig. 6 is a perspective view of the utility lighter incorporated with a safety arrangement according to a third preferred embodiment of the present invention.

Fig. 7 is a partially sectional schematic view of the safety arrangement of the utility lighter according to the above third preferred embodiment of the present invention.

Fig. 8 is a perspective view of an alternative mode of the pusher button of the utility lighter according to the above first, second and third preferred embodiments of the present invention.

### Detailed Description of the Preferred Embodiment

Referring to Figs. 1 to 2 of the drawings, a utility lighter incorporated with an improved safety arrangement according to a first preferred embodiment of the present invention is illustrated, wherein the utility lighter 10 comprises a casing 20 which comprises a lighter housing 21 and a lighter rod 22 upwardly extended from the lighter housing 21, an ignition system 30 supported by the casing 20, and a safety arrangement 40 supported by the casing 20 for automatically retaining the utility lighter 10 in a locked state, i.e. prevent the lighter 10 from being ignited.

As shown in Fig. 2, the lighter housing 21 and the lighter rod 22 has an internal cavity 211 and a transmitting cavity 221 therein respectively for receiving the ignition system 30 and the safety arrangement 40, wherein the internal cavity 211 is communicated with the transmitting cavity 221. The utility lighter 10 further comprises a fuel storage housing 50 loaded with liquefied fuel and disposed in the internal cavity 211 of the lighting housing. The fuel storage housing 50 is communicated with the ignition system 30 for igniting a light from the lighter 10.

As shown in Figs. 1 and 2, the ignition system 30 comprises a piezoelectric unit 31 for generating piezoelectricity, an spark-generating tip 32 extended from the piezoelectric unit 31 for generating spark, a gas-emitting nozzle 33 which is communicated with the fuel storage housing 50 and adapted to release gaseous fuel when it is uplifted by a gas lever 34, and a pusher button 35 operatively attached to the piezoelectric unit 31 as well as the gas-emitting nozzle 33 through the gas lever 34. The ignition system 30 further comprises a gas tube 36 extended between the gas-emitting nozzle 33 and an ignition tip 361 positioned at the top end portion of the transmitting cavity 221. The gaseous fuel which is released through the gas-emitting nozzle 33 is transmitted via the gas tube 36 to the ignition tip 361 where the gaseous fuel is finally emitted to the atmosphere.

The piezoelectric unit 31 has a movable part 311 and a fixed part 312, wherein when the movable part 311 is depressed downwardly to a certain ignition point, piezoelectricity is generated in the fixed part 312 and sparks are generated from the spark-generating tip 32 towards the ignition tip 361. On the other hand, the lighter housing 21 further has a pusher cavity 212 and the pusher button 35 is disposed in the pusher cavity 212 in a vertically movable manner and operatively attached to the movable part 311 of the piezoelectric unit 311.

When the pusher button 35 is depressed downwardly, the movable part 311 of the piezoelectric unit 31 is then depressed downwardly by the pusher button 35. When the movable part 311 is depressed to the ignition point of the piezoelectric unit 31, sparks are generated at the spark-generating tip 32. At the same time, the pusher button 35 depresses a depressing end 341 of the gas lever 34 downwardly and therefore uplifts the uplifting end 342 of the gas lever 34 so as to lift up the gas-emitting nozzle 33 for releasing gaseous fuel to the gas tube 36 which then releases the gaseous fuel outside the utility lighter 10 through the ignition tip 361. The spark-generating tip 32 is extended from the fixed part 312 of the piezoelectric unit 31 to a position next to the ignition tip 361 in the lighter rod 22 of the casing 20. The gas released through the ignition tip 361 is then ignited by the sparks generated at the spark-generating tip 32.

Referring to Figs. 3A and 3B of the drawings, the pusher button 35 has a locking cavity 351 provided therein for receiving the safety arrangement 40 of the utility lighter 10. The safety arrangement 40 comprises a stop post 41 and a guider latch 42, which are integrally projected from a top wall of the pusher button 35 downwardly and extended vertically and spacedly inside the locking cavity 351 of the pusher button 35 so as to define a guiding slot 44 therebetween.

As shown in Figs. 1 and 2, the safety arrangement 40 further comprises a locking member 43 supported by the lighter housing 21 and positioned right below the pusher button 35. The locking member 43 comprises an outer switching member 431 extended outside the lighter housing 21 through a safety slot 37 and a stopper 433 slidably supported inside the lighter housing 21, wherein the stopper 433 is connected to the switching member 431 by a driver member 434. The switch member 431 is adapted for being switched, as shown in Fig. 1, by means of sliding along the safety slot 37, between a locked position and an unlocked position of the safety slot 37, and the stopper 433 is capable of being driven by the switching member 431 through the driver member

434 to move between the locked position and the unlocked position, wherein the stopper 433 is arranged to bias against the stop post 41 when the locking member are in the locked position, as shown in Fig. 2.

The utility lighter 10 further comprises a resilient element 60 securely mounted in the lighter housing 21 and adapted for applying urging forces to the locking member 43 to push the locking member 43 to the locked position. On the other hand, the piezoelectric unit comprises a resilient element 310 therein for applying an upward pressure on its movable part 312 so that the movable part 312 is normally retained undepressed.

In the locked position, as shown in Figs. 3A to 3F, the stopper 433 are just aligned with the stop post 41 of the pusher button. Note that the safety slot 37 is formed on a side wall of the lighter housing 21 as shown in Fig. 1 of the drawings. According to the first preferred embodiment of the present invention, the outer switching member 431 is integrally extended from the stopper 433 of the locking member. Also, the locking member 43 further has two sliding cavities 432 formed at two sides of the stopper 433 for the guider latch 42 and the stop post 41 to be slid therein.

When the locking member 43 is in normal locked position and when a user tries to depress the pusher button 35, as shown in Figs. 2 and 3A, the stop post 41 will bias against the stopper 433, and therefore restricts the pusher button 35 from further moving downwardly. In other words, the stop post 41 is positioned right above the stopper 433 of the locking member 43, so that the downward movement of the pusher button 35 is blocked and locked by the locking member 43. Therefore, the pusher button 35 cannot depress the piezoelectric unit 31 to generate a spark at the spark-generating tip 32. Also, the depressing end of the gas lever 34 is not significantly depressed to uplift its uplifting end due to the blocking of downward motion of the pusher button 35 by the stopper 433. As a result, the gas-emitting nozzle 33 does not emit gaseous fuel required to ignite the lighter 10. Whereby, the utility lighter 10 cannot be ignited and the lighter 10 is locked.

Referring to Figs. 1 to 3, to unlock the utility lighter 10, switch the switching member 431 along the safety slot 37 to the unlocked position, wherein the locking member 43 is pushed aside until the stopper 433 moves from right below the stop post 41 to right below the guider latch 42 of the pusher button 35, as shown in Fig. 3B.

The guider latch 42 has a tapered guiding end having a slanted surface 421 inclined toward the stop post 41 and adapted for biasing against a top end of the stopper 433. At the unlocked position, the user is free to depress the pusher button 35 to ignite the utility lighter 10. When the locking member 43 is in unlocked position and the pusher button 35 is depressed downwardly by a depressing force  $F$ , the slanted surface 421 of the guider latch 42 will bias against the top end of the stopper 433, as shown in Fig. 3C. The slanted surface 421 of the tapered guiding end of the guider latch 42 enables the pusher button 35 to be further depressed that causes the locking member 43 to move backward to its original locked position and, at the same time, drives the guider latch 42 to move downwardly, as shown in Fig. 3D, until the stopper 433 is inserted into the guiding slot 44. In other words, a user can now be able to freely depress the pusher button 35 to ignite the lighter 10 without any blocking from the locking member 43. Note that the above-mentioned backward movement of the locking member will be limited and blocked by the stop post 41, as shown in Figs. 3E and 3F.

In addition to the resilient element 60 and the resilient element 310 provided inside the piezoelectric unit 31, the face that the pusher button 35 is operatively connected to the movable part 312 of the piezoelectric unit 31.

Therefore, once the user has ignited the utility lighter 10, he/she can just simply relief the pusher button 35 and the locking member 43, and then the utility lighter 10 automatically returns to its locked condition in which the pusher button 35 and the locking member 43 are rebounded back to their original positions respectively by the urging forces of the resilient element 60 and the piezoelectric unit 31 respectively. That is, the piezoelectric unit 31 will rebound the pusher button 35 upwards from the ignition position as shown in Fig. 3F to the locked position as shown in Fig. 3A and the resilient element 60 will rebound the locking member 43 to move from the unlocked position as shown in Figs. 3E and 3F back to its original locked position as shown in Fig. 3A.

Referring to Fig. 1 of the drawings, the casing 10 further has a finger guide 214 extended around the pusher button 35 so as to define a finger loop 215 therein for fittedly receiving a user's finger therein to press the pusher button 35 comfortably. In addition, the fuel storage housing 50 further comprises a flame regulator 51 for adjusting the average flow rate of the gaseous fuel coming out from the fuel storage housing 50 through the gas-emitting nozzle 33. The flame regulator 51 has a control portion extended outside the lighter housing 21 through a regulator slot 216. Whereby, a user can be able



to regulate the gaseous fuel's flow rate by adjusting the flame regulator 51, so as to regulate the magnitude of the light ignited.

To ignite the utility lighter 10, a user must unlock the lighter 10 first by pushing the outer switching member 431 of the locking member 43 along the safety slot 37 from the locked position to the unlocked position. While the utility lighter 10 is maintained at the unlocked condition, the pusher button 35 is ready for being depressed downwardly so as to depress the movable part 311 of the piezoelectric unit 31 to generate sparks at the spark-generating tip 32 at the top end portion of the lighter rod 22. At the same time, when the pusher button 35 is being depressed, the pusher button uplifts the gas-emitting nozzle 33 via a gas lever 34, and therefore gaseous fuel is released at ignition tip 361.

After the ignition, the locking member 43 is rebounded back by the resilient element 60 and the pusher button is rebounded by the piezoelectric unit 31 so that, eventually, the utility lighter 10 automatically returns to its normal locked state. According to the first preferred embodiment of the present invention, the resilient element 60 is a regular compressive spring.

Referring to Figs. 4 and 5 of the drawings, a utility lighter 10' incorporated with a safety arrangement according to a second preferred embodiment of the present invention is illustrated. According to the second embodiment of the present invention, the locking member 43' of the safety arrangement 40' is modified to be rotatably mounted in the lighter housing 21 right below the pusher button 35' and is adapted for rotatably switching between a locked position and an unlocked position of an arc-shaped safety slot 37'.

The locking member 43' comprises a driver member 434' having a bottom pivot end pivotally supported in the lighter housing 21, an outer switching member 431' connected to a top switch end of the driver member 434' and extended outside the lighter housing 21 through the safety slot 37' for switching operation by a user, and a stopper 433' integrally and upwardly extended from the top switch end of the driver member 434' to normally positioned right below the stop post 41' of the pusher button 35'. The safety arrangement 40' further comprises a resilient element 60' for retaining the locking member 43' in a locked position normally, wherein the stopper 433' is arranged to bias against the stop post 41' of the pusher button 35' when the locking member 43' is in the locked position as shown in Fig. 5A. Furthermore, the stopper 433' has an inclined

biasing surface 4331' at its top end with respect to horizontal. Note that the safety slot 37' is curved in shape so as to suit the pivotal movement of the locking member 43'. According to the second preferred embodiment of the present invention, the resilient element 60' is a coil spring.

5 When the locking member 43' is in normal locked position, the locking member 43' is retained to have its the inclined biasing surface 4331' of the stopper 433' right below the bottom end of the stop post 41', as shown in Fig. 5, so as to block any downward movement of the pusher button 35'. Therefore, when a user tries to depress the pusher button 35' downwardly, the stop post 41' will bias against the stopper 433' and  
10 thus the downward motion of the pusher button 35' is blocked. The user cannot depress the pusher button 35' anymore and the lighter is locked.

When the locking member 43' is switched to the unlocked position by moving the switching member 431', the locking member 43' is so pivoted until the inclined surface 4331' of the stopper 433' is positioned below the tapered guiding end of the  
15 guider latch 42' and adapted to fittedly bias against the slanted surface 421' of the guider latch 42'. When a user depresses the pusher button 35' downwardly, the stop post 41' will slightly push aside the stopper 433' of the locking member 43' that diverts the stopper 433' to slide into the guiding slot 44'. Then, the pusher button 35' can now be depressed freely to ignite the utility lighter 10' without any blocking from the locking  
20 member 43'.

To ignite the utility lighter 10', a user has to switch the locking member 43' from the locked position to the unlocked position of the safety slot 37'. Then, the user can depress the pusher button 35' to ignite the lighter 10'. After the ignition, when the user relieves both the pusher button 35' and the locking member 43', the resilient element 60'  
25 can drive the locking member 43' to return to its original locked position and the pusher button 35' is rebounded back to its original positions by the piezoelectric unit 31', so as to automatically render the lighter 10' in the locked state after use.

Referring to Figs. 6 and 7 of the drawings, a utility lighter 10A incorporated with a safety arrangement according to a third preferred embodiment of the present  
30 invention is illustrated, wherein the locking member 43A and the safety slot 37A of the ignition system 30A are alternatively modified. According to the third preferred embodiment of the present invention, the locking member 43A comprises a driver

member 434A which is a connecting arm transversely and slidably mounted in the lighter housing 21 with respect to the lighter housing 21, a switching member 431A connected to an outer end of the driver member 434A and extended outside the lighter housing 21 through a safety slot 37A formed at a side portion of the lighter housing 21, a stopper 433A longitudinally extended, with respect to the lighter housing 21, from an inner end of the driver member 434A to position right below the stop post 41A adapted for biasing against the stop post 41A in the locking cavity 351A when the locking member is in the locked position, as shown in Fig. 7 of the drawings. Two sliding cavities 432A are formed at two sides of the stopper 433A.

When the locking member 43A is in the locked position, the stopper 433A is positioned right below the stop post 41A in the locking cavity 351A. When a user tries to depress the pusher button 35A, the stop post 41A will bias against the stopper 433A of the locking member 43A, and as a result, the downward movement of the pusher button 35A is blocked by the stopper 433A and the utility lighter 10A is locked.

By pushing down the switching member 431A, the locking member 43A is driven to the unlocked position that the top end of the stopper 433A of the locking member 43A is pushed to move to a position right below the slanted surface 421A of the tapered guiding end of the guider latch 42A. In this condition, when a user depresses the pusher button 35A downwards gradually, the slanted surface 421A will slightly push the locking member 43A aside and the stopper 433A will slide into the guiding slot 44A. In other words, the stop post 41A and the guider latch 42A will be depressed into the two sliding cavities 432 of the locking member 43A.

According to the third embodiment of the present invention, a distance formed between the tapered guiding end of the guider latch 42A and the bottom end of the stop post 41A is preferred to be slightly larger than the thickness of the outer switching member 431A of the locking member 43A, so that when the outer switching member 431A is completely pressed into the lighter housing 21A, the top side edge 434A of the stopper 433A is positioned right below the slanted surface 421A.

In order to ignite the utility lighter 10A, a user has to press the outer switching member 431A to the unlocked position and, at the same time, to depress the pusher button 35A to ignite the lighter 10A. After the ignition, the resilient element 60A will rebound the locking member 43A to its original position and the piezoelectric unit 31A

will rebound the pusher button 35 to its original undepressed position. Moreover, the locking member 43A further has a ring-shaped stopping rib 436A formed around the driver member 434A for stopping the outward motion of the locking member 43A which is resulted by the urging force exerted by the resilient element 60A to the locking member 43A. Whereby, the stopper 433A of the locking member 43A is always aligned with the stop post 41A in the locking cavity 351A. Note that the resilient element 60A used in the third preferred embodiment is a regular compressive spring

As shown in Fig. 8, an alternative mode of the pusher button 35'' is illustrated, which is alternatively modified from that of the above first, second and third embodiments, wherein the stop post 41'' and the guider latch 42'' are spacedly protruded from a bottom portion 352'' of a side surface of the pusher button 35''. Correspondingly, the locking member 43'' is preferred to be slidably supported adjacent to a side wall of the lighter housing 21 and positioned right below the stop post 41'' and the guider latch 42''.

In view of the above first, second and third embodiments, the utility lighter of the present invention substantially achieves the following distinctive features and advantages:

(1) The utility lighter is capable of automatically locking the lighter of the present invention from being accidentally ignited after every use and when it is idle or not in use.

(2) The utility lighter can only be ignited by two simultaneous actions of a user, i.e. an action of unlocking the safety arrangement and an action of igniting the lighter.

(3) The utility lighter does not significantly alter the original structure and shape of conventional lighters, so as to minimize the manufacturing cost of the lighter of the present invention.